Closed
35-01

SCANNED Carren Johnson 3/10/15

Franklin County Landfill
Closure Plan

Louisburg,
North Carolina
April 8, 1994

HAZEN AND SAWYER
Environmental Engineers & Scientists
RALEIGH, NORTH CAROLINA

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April 5, 1994

Mr. James C. Coffey
Supervisor Permitting Section
Solid Waste Section
N.C. Department of Environment,
Health and Natural Resources
P.O. Box 27687
Raleigh, NC 27611-7687

Re: Closure Plan Submittal
Franklin County Landfill
Permit No. 35-01
Louisburg, NC

Dear Mr. Coffey:

Franklin County hereby submits this Closure Plan for the currently operating Solid Waste Landfill in accordance with 15A NCAC 13B. The County will cease disposal of all municipal solid waste at the Louisburg facility prior to April 9, 1994. This facility has qualified for the small landfill compliance extension granted in September, 1993.

Descriptions of the facility, closure activities, post closure monitoring and care, and end use of the site are described herein.

Submittal of this Closure Plan does not constitute certification of closure of the Louisburg facility. The County has completed some of the closure operations described in the Closure Plan, but others will be completed after the facility ends disposal operations. Certifications for closure of the MSW landfill areas will be provided by the County once Closure operations have been completed.

If you have any questions or require additional information, please contact us.

Very truly yours,

HAZEN AND SAWYER, P.C.

John A. Bove, P.E.
Senior Principal Engineer

Donald L. Cordell, P.E.
Vice President

JAB/DLC/wp
Attachment: Closure Plan
cc: David Hodgkins, Franklin Co.
John Faulkner, Franklin Co.

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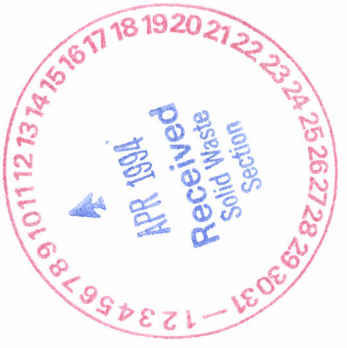

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FRANKLIN COUNTY LANDFILL
LOUISBURG, NORTH CAROLINA
CLOSURE PLAN

1. Facility Background and Description

The Franklin County landfill, located on SR 1109 near Louisburg, was opened to accept Municipal Solid Waste (MSW) in 1973. (Permit No. 35-01)

The entire landfill property, as modified, is 93 acres in size. The facility consists of approximately 35 acres of unlined MSW landfill, in two cells located on either side of the central access roadway. The currently operating cell located on the eastern half of the site is the only portion of the MSW landfill that has been used for disposal since October 9, 1993. This cell, with the exception of an approximately 2.7 acre on the south end of this cell, will be subject to closure under the current State regulations (15A NCAC 13B.1627). This area of the active cell and the inactive cell west of the access road have not accepted waste after October 9, 1991 and are subject to closure requirements of rule .0505 only.

There are no Construction and Demolition Debris (C&DD) or tire disposal facilities on the site.

The Franklin County landfill receives less than 100 tons of refuse per day so it was subject to the 6-month Subtitle D exemption for small landfills granted in September, 1993. The County will cease operations of the MSW landfill on or before April 8, 1994.

The landfill has only accepted Municipal Solid Waste during its operation, but the site has collection/processing areas for tires, yardwaste, and a convenience center for household garbage and recyclable materials.

The facility also includes a public dropoff area where residents can dispose of household refuse and a number of recyclable products. A recyclable metals storage area is included as well. The entire site is served by a truck scale.

The location of these disposal or processing areas and a topographic map of the entire facility are shown on "Existing Site Conditions", Drawings G1 and G2 of the Closure Plan.

The County will cease disposal operations on or before April 8, 1994, but will continue temporary storage of metals, tires, yardwaste and public convenience areas. The MSW will be handled by a transfer station currently

under construction on the existing site. The location of the transfer facility is shown on Drawing G1.

2. Description of Disposal Facilities

The Franklin County landfill has been used for the disposal or processing of MSW, tires, white goods, and yard waste. The landfill property is that area bounded to the South by SR 1109, to the north by Cedar Creek, and on the east and west sides by private property as shown on Drawings G1 and G2.

Separate areas on the landfill property have been designated for the disposal or processing of wastes accepted by the landfill. A description of these facilities follows.

2.1 MSW Landfills

Two landfill cells currently exist at the landfill site. The active and closed landfill cells are not contiguous and are separated by the access road running in between the two cells. The active area is shown on Drawings G1 and G2 and consists of an approximately 15 acre cell located on the eastern half of the landfill property. The 15 acre active area has been in operation since 1973 and will not receive waste after April 8, 1994. The approximately 19 acre inactive area west of the access road received waste from 1973 to 1989. Since the 19 acre cell stopped receiving waste prior to October 9, 1991 it will be referred to herein as the "Pre-1991" Cell. Similarly, the 15 acre active portion of the eastern cell will be referenced as the "Post-1991" Cell, and will be subject to Subtitle D closure requirements.

It should be noted that approximately 2.7 acres located on the extreme southern end of the currently active cell has not received waste since October, 1991 and has been designated as a "Pre-Subtitle D" area on Drawing G2.

2.2 Tire Storage Area

An area south of the Pre-1991 cell has been used as a tire storage area. Tires are stockpiled and later hauled off site by Recycled Products Management, Inc. from Sanford, NC under contract with Franklin County. The contractor comes on a bi-weekly basis to load the tires and haul off for processing. After closure of the MSW landfill, the tire stockpile area will continue to be used and all tires will be disposed of off-site.

The tire storage site is shown on Drawing G2.

2.3 White Goods Area

White goods and other recyclable metals are received at an approximately 0.3 acre area located on the southeast corner of the Post-1991 Cell. The white goods are stockpiled until a contractor picks the items up, where he in turn removes the motors and sells the remains for scrap metal. This operation will continue after the MSW landfill is closed.

2.4 Yard Waste Area

A yard waste facility is located in an area consisting of approximately 2.3 acres to the south of the Pre-1991 cell (See Drawing G2). Yard waste is periodically processed by a subcontractor with a grinder and given away free to the public for mulch. Several windrows for composting of yardwaste are located in this area. The County turns the windows with a front end loader. These operations will continue after closure of the MSW landfill.

2.5 MSW Transfer Facility

A Transfer Facility for MSW is currently under construction. It is located in the borrow area north of the disposal areas, as shown on Drawing G1. Franklin County has contracted with a private hauler to haul and dispose of the MSW and limited quantity of Construction and Demolition Debris (C&DD). Franklin County personnel will operate the facility, which is scheduled to begin operations on April 9, 1994.

3. Description of Facility Closure

The closure activities for the Franklin County MSW landfill will be based upon applicable compliance criteria for the Pre-91 and Post-91 areas. A description of the closure for each facility is provided below.

3.1 MSW Landfill - Post 1991 Areas

An approximately 15 acre area of the currently operating cell is the only landfill area that received MSW after October 9, 1991. For this reason, this portion of the cell is to be closed in accordance with Subtitle D requirements for Post 1991 MSW landfills. The typical final cover cross section is presented on Drawing G4 of the Closure Plan drawings and is described below.

- Daily or Intermediate Cover - These layers are placed directly over the refuse. Daily Cover consists of at least 6-inches of compacted on-site soils. Intermediate Cover consists of a minimum of 12-inches of the same material used for Daily Cover. These layers are placed during landfill operations, although additional cover soil may be placed during Final Cover construction in order to grade localized areas.

- Compacted Soil Barrier - This layer consists of at least 18-inches of soil with a maximum permeability of 1×10^{-5} cm/sec. The Compacted Soil Barrier is constructed directly over the Daily or Intermediate Cover.

- Vegetative Support Soil - A minimum 6-inch thick layer to support vegetation and minimize erosion will be placed over the Compacted Soil Barrier. This layer will consist of on-site or imported soil free from large cobbles and boulders. Only nominal compaction of this layer is required. The surface of this layer will be seeded with durable local grasses as shown on the Seeding Schedule in the Closure Plan Drawings.

The proposed Final Cover Grading Plan for the Post - 1991 active cell is presented on Drawing G3. The elevations shown on these drawings reflect the proposed top of Final Cover. Erosion and Sediment Control for the final cover is shown on Drawing EC-1.

MSW Landfill - Pre 1991 Areas

Areas of the MSW landfill not receiving waste after October 9, 1991 are subject to closure criteria outlined in 15A NCAC 13B.0505. These regulations require that the refuse be covered with "at least two feet of suitable compacted earth". The surface of the final cover is to be seeded.

While no areas of the MSW landfill have been officially closed by the Department of Environment, Health, and Natural Resources (DEHNR), all of the Pre-1991 areas shown on Drawings G1 and G2 have been previously covered as operations in these areas ended. Vegetation on the landfill surface ranges from sparse to dense grasses and brush. Some pine trees have grown on the southern end of the eastern cell (the Pre-1991 area).

The County will conduct a field testing program to verify the final cover thickness at various locations on the Pre-1991 MSW landfill areas. As a first step, the affected areas will be divided into approximately 1-acre grids. The final cover will be probed by means of a hand auger at a frequency of at least one probe per grid. The depth of final cover and a visual soil classification will be recorded at each probe location. The location of each probe, as well as the results of the investigation will be shown on a topographic drawing.

Where results of the cover investigation indicate insufficient thickness of final cover, additional cover will be placed. For areas where suitable cover exists, the DEHNR will be petitioned for official closure of the Pre-1991 areas.

4. Erosion and Sediment Control

Sedimentation at the active landfill and borrow area is currently controlled by a sediment basin at the north end of the site. The land disturbance required by the closure activities described in this plan will require additional sedimentation control measures to be established. All measures required by this closure plan will be permanent and remain in service during the post closure period of the landfill.

The 15 acre Post-1991 MSW cell and borrow area will require additional erosion and sedimentation control measures. Measures required for the closure of this area are shown on Drawing EC1. The solid waste transfer facility located to the north of the active landfill cell has previously approved runoff and erosion control measures, which are currently under construction. All other areas on the site have adequate runoff conveyance structures in place and healthy stands of vegetation established.

The establishment of a healthy stand of vegetation is vital to any erosion and sedimentation control plan. The seeding schedule to be followed in this Closure Plan is given on Drawing EC2. In accordance with the 1973 North Carolina Sedimentation Pollution Act, areas which reach final grade shall be seeded within 30 working days or 120 calendar days.

4.1 Post-1991 Cell

The slope of the final cover will not exceed 3H:1V (See Drawing G3). A series of silt fences and diversion berms will be used to control erosion of the cap until vegetation can be established. Stormwater off of the west side of the final cover of the Post-1991 cell will flow to a non-erosive ditch adjacent to the access road and eventually to the permanent sediment basin.

4.2 Borrow Site

The borrow site drains predominantly in an northerly direction and runoff is collected in the permanent sediment basin. Final grade of the borrow site will provide positive drainage to the basin with a minimum slope of 2%, if allowed by existing grade. Sedimentation from the borrow site will be controlled by the permanent sediment basin. The current basin has a capacity to handle runoff from the entire site. The basin itself will be cleaned of accumulated sediment, vegetation and debris and any repairs necessary to restore it to its original condition and elevations will be made. See Drawings EC1 and EC2. Minor revisions including ditching and fine grading will be implemented in order to assure positive drainage to the permanent sediment basin.

4.3 Pre-1991 Cell

Diversion swales are located along the eastern and western sides of the Pre-1991 Cell adjacent to the toe of the side slopes. The cap is predominantly vegetated and excessive erosion is not present. The swales carry stormwater from the final cover of this Cell to the basin. Additional erosion control measures will not be required for this cell.

5. Final Use of Facility

The Franklin County landfill property described herein and shown on Drawings G1 & G2 has no designated end use for the five year Post Closure period other than to process waste as described above.

The MSW Transfer Facility will operate after the close of disposal operations. Yard waste, white goods, recyclable metals and tires will continue to be processed. The public convenience and recycling area will continue to be open to the public. Scales will continue to operate to support the Transfer Facility, and the County office will remain in place. The County will continue to provide access to the existing radio tower for the State personnel.

6. Post Closure Care Activities

During the 5 year post closure care period, Franklin County will perform the following activities on the closed MSW landfills.

6.1 Semi-Annual Maintenance and Inspection

- Inspect the final cover for erosion damage, excessive settlement or subsidence, and sloughing or other evidence of slope failures. The final cover contours will be maintained in order to promote surface water runoff and minimize surface ponding and infiltration of surface water into the waste. Damaged portions of the final cover will be repaired immediately.

- Inspect and maintain a healthy vegetative cover over the site. If distress to vegetation is noted, the cause will be determined and corrected. Grassy areas of the Pre- and Post-1991 landfill cells will be mowed at least twice annually (spring and fall) to a nominal height of 8 inches. With the exception of the area of the Pre-1991 cell currently planted with pine trees, semi-annual maintenance will include the location and removal of any trees greater than 3 feet in height. Trees will be removed by cutting at the base. Any areas where trees have died or toppled will be repaired by removing the tree and stump and placement of compacted soil in the void left by the stump.

In the Pre-1991 area where trees are to remain in place, any trees that have toppled or show signs of distress should be removed and the ground surface repaired as outlined above.

- Inspect runoff conveyance structures including sediment basins for damage and excessive buildup of sediment. Damaged structures will be repaired immediately. Sediment will be removed from the basins and disposed of in an approved manner if the volume of the measure is reduced by 50%. The need for sediment cleanout will be greatly reduced in time as the vegetative cover becomes better established. Basins will likely require annual cleanout.

- Inspect and maintain groundwater monitoring wells. All wells will remain locked. Wells will be inspected above ground for damaged or missing parts and signs of tampering. The Division of Solid Waste Management will be notified within 30 days if well contamination due to tampering, missing, or broken parts is suspected. If contamination is not suspected, the well will be repaired immediately.

- Obtain water quality samples from the facility monitoring wells and surface water monitoring points in accordance with the approved Ground Water Monitoring Program.

6.2 Periodic Maintenance and Inspection

For the 5 year Post Closure Period:

- Inspect sediment basin and stormwater conveyance structures for excessive accumulation of sediments and erosion after every major rainstorm. Sediment will be cleaned out if the volume of the measure is significantly reduced (>50%). Damaged structures will be repaired immediately.

- Inspect final cover of facility for erosion and ponding of surface water after every major rainstorm. Eroded areas of the cover will be documented, repaired, and seeded in accordance with the seeding schedule on Drawing EC1. Areas where ponding occurs will be filled with soil, seeded, and documented.

- Inspect the ditches adjacent to the main access roadway and in the vicinity of the main sediment basin after each major rainstorm. The ditches must be kept clear of debris. Grass must be maintained in the synthetic-lined portion of the ditches by mowing without impacting the synthetic lining. Any areas exhibiting signs of significant erosion should be repaired promptly. Repair should include regrading to restore design ditch profile and section, replacement of synthetic

lining and reseeding. Temporary repair during periods when seeding is not practical can be accomplished using rip-rap.

- During repair of eroded areas on final cover slopes, temporary erosion control measures should be employed. Such measures may include rip-rap, silt fence or hay bales.

- Report any evidence of unauthorized access to the facility. Repair existing fences or erect new fences, berms, etc. to restrict access.

7. Groundwater and Surface Water Monitoring

The existing facility ground and surface water monitoring program will be continued by the County for the five year post-closure period. According to the latest water quality analyses for the Franklin County site (February 8, 1994), a total of 8 groundwater monitoring wells (MW1, 2, 3, 3d, 4-7) and two surface water monitoring points are sampled. Monitoring well locations were surveyed in March, 1994 and are shown Drawings G1 and G2. The two surface water monitoring points are located on the creek to the north of the property.

The upgradient well is MW-1, located on the south end of the site near SR 1109. Wells MW4 and MW5 appear to be downstream wells monitoring the currently active east cell. Wells MW2, MW3 and MW3d are downstream of inactive western cells. MW6, located to the west of the inactive cell is a second upstream monitoring well. MW7, located north of the sediment basin, is downstream of the entire disposal area.

Semi-annual sampling will be conducted in accordance with the DEHNR approved program for the post closure period.

APPENDIX I - FINAL COVER SPECIFICATIONS

- Final Cover Earthwork
- Final Cover Grading, Erosion Control and Landscaping

SECTION 2C
FINAL COVER EARTHWORK

PART 1 - GENERAL

1.01 Work Included

Furnish all labor, equipment and materials required to complete all work associated with excavation, off site borrow, sealing, discing, drying, undercutting, backfill, embankments, stockpiling topsoil and any excess suitable material in designated areas, in-place compaction of embankments, barrier soils and other related and incidental work as required to complete the work shown on the Contract Drawings and specified herein.

The work shall include, but not be limited to:

1. Place and compact, as required, final cover barrier and vegetative support soils to the lines and grades shown on the Contract Drawings.

2. Construct perimeter containment berms, where indicated on the Contract Drawings using suitable soils,

3. Excavate soil for ditching or piping outside the containment berms as required by the Contract Drawings and backfill using the materials shown on the Contract Drawings,

4. Place and compact on-site soils for permanent access roads,

5. Perform all surveys necessary to establish and verify lines and grades for all earthwork, including thickness of soil layers of the final cover, cuts, fills, and general grading.

All earthwork shall conform with the lines, grades, and cross sections shown on the Contract Drawings or established by the Engineer.

1.02 Related Work

Related Contract Work is described in the following Section(s) of the Specifications:

Work	Section
Final Cover Grading, Erosion Control, and Landscaping	2J

1.03 Testing and References

The current editions and addenda of the following publications are made part of the Specifications and are applicable to the extent indicated by the specific reference. Testing performed shall conform to the following applicable standards:

1. North Carolina Department of Transportation (NCDOT) Standard specifications for Aggregates.

2. American Society for Testing and Materials (ASTM):

ASTM C 127	Test for Specific Gravity and Absorption of Coarse Aggregate.
ASTM C 136	Test for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 422	Particle Size Analysis of Soils.
ASTM D 423	Test for Liquid Limit of Soils.
ASTM D 424	Test for Plastic Limit and Plasticity Index of Soils.
ASTM D 698	Standard Method of Test for the Moisture - Density Relations of Soils Using a 5.5 lb. (2.5 kg) Rammer and a 12-inch (305 mm) Drop.
ASTM D1556	Test for Density of Soil in Place by the Sand-Cone Method.
ASTM D1557	Test for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lbs. (4.5 kg) Rammer and 18-inch (457 mm) Drop.
ASTM D2167	Test for Density of Soil in Place by the Rubber-Balloon Method.
ASTM D2216	Test for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
ASTM D2434	Permeability of Granular Soils (Constant Head)
ASTM D2487	Test for Classification of Soils for Engineering Purposes.
ASTM D2922	Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

ASTM D5084 Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

1.04 Product Handling

Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site or otherwise disposed of as directed by the Owner.

PART 2 - MATERIALS

2.01 Compacted Embankment

A. Soils capable of being compacted to the specified densities, with the exceptions of topsoil and organic material, meeting the requirements stipulated in Paragraph 2.01 B below, may be used as select fill for backfilling, constructing embankments and for roadway subgrades where indicated on the Contract Drawings. Compacted Embankment materials shall be compacted at a moisture content satisfactory to the Engineer, which shall be approximately that required to produce the maximum density (ASTM D698). The Contractor shall dry or add moisture to the compacted embankment material when required to provide a uniformly compacted and stable embankment. When air drying of excavated material is necessary, the Contractor may spread, disc, windrow, etc. as necessary at locations on site as directed by the Engineer. Fill material borrowed off-site, where required, shall be of a nature meeting the requirements stipulated herein.

B. The Compacted Embankment shall consist of clean natural soil classified as SM, SP, SC, ML, MH, or CL-ML, using the Unified Soil Classification System (USCS) containing no topsoil or other deleterious material.

The Compacted Embankment shall be placed in maximum 10-inch thick horizontal lifts (loose measure) and shall be compacted as required in Section 3.07, Compaction. Rock fragments, cobbles and boulders shall not exceed 6 inches in any dimension.

2.02 Fine Grained Soil Cover

A. Soils placed as final cover over areas specifically designated on the Contract Drawings and containing no topsoil, debris, refuse or other deleterious material and meeting the requirements stipulated in Paragraph 2.02B below shall be used as Fine Grained Soil Cover.

B Fine Grained Soil Cover shall consist of clean natural soil classified as SM, SC, ML, MH, CL-ML, CL, or CH using the Unified Soil Classification System (USCS). This material shall be placed at a moisture content that will allow access by construction and operations vehicles and minimize dust generation. Fine-Grained Soil Cover shall be placed in maximum 1-foot thick lifts and be compacted as required in Section 3.07.

2.03 Compacted Soil Barrier

Compacted Soil Barrier, whether on-site soils or imported off-site material, shall conform to the following requirements:

A. Soil Classification - The soil shall be clean natural fine-grained soils free from organics, debris or other deleterious material and shall be classified as CL, CH, MH, ML, CH-MH or CL-ML soil types using the Unified Soil Classification System (USCS).

B. Gradation - The soil shall have at least 50% by weight passing through No. 200 U.S. Standard sieve. The maximum particle size shall be 1-inch.

C. The in-place coefficient of permeability of the Compacted Soil Liner shall be less than 1×10^{-5} cm/sec at a density of at least 93% of the maximum Standard dry density and moisture contents ranging from 0 to 6% above the optimum moisture content (ASTM D698).

2.04 Crushed Stone, Screened Gravel or ABC

Crushed stone or screened gravel shall be used for pipe bedding and/or drainage layers wherever shown on the Contract Drawings and specified herein. ABC shall be used where indicated on the Contract Drawings or as specified herein.

For Natural Drainage Media and Pipe Bedding - The coarse aggregate shall meet the requirements of Aggregate standard size No. 57 or No. 67, as defined by NCDOT Standard Specifications. The thickness of the stone shall be as indicated on the Contract Drawings.

2.05 Rock

Any material occupying an original volume of at least one cubic yard which cannot be excavated with a single-tooth riper drawn by a crawler tractor having minimum draw bar pull rated at not less than 56,000 pounds (Caterpillar D 8K, D9 or equivalent) or by a Caterpillar 977 front-end loader or equivalent. Excavation of material with larger equipment will be paid as Earth excavations unless Contractor demonstrates inability to excavate with above specified equipment.

PART 3 - EXECUTION

3.01 Borrow Area Excavation

A. Soils may be excavated from on-site borrow areas designated by the Owner and shown on the Contract Drawings. All soil material excavated (excluding topsoil), regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, weathered rock, boulders, and all other obstacles encountered and shown to be removed within the limits of excavation shown on the Contract Drawings or specified herein.

B. Rock excavation includes materials encountered that meet the definition of rock presented in Section 2.05 of these specifications.

C. All suitable material removed in the excavation shall be used as far as practicable in the placement of final cover or embankments, as may be indicated on the plans or directed by the Engineer. Excavation shall be made in accordance with the grades and details shown on the Contract Drawings and as specified herein. The Engineer will designate materials that are unsuitable.

D. During excavation, soils may be visually classified by the Engineer or his representative and directed to the appropriate stockpile. The Contractor shall be responsible for maintaining the integrity of each stockpile and assuring that the end use of the material is suitable as outlined in the Specifications.

E. Excavation slopes shall be flat enough to avoid slides that will cause disturbance of the subgrade or damage of adjacent areas. Excavation requirements and slopes shall be as indicated in the Contract Drawings. The

Contractor shall intercept and collect surface runoff both at the top and bottom of cut slopes.

F. All cuts shall be brought to the grade and cross section shown on the Contract Drawings, or established by the Engineer, prior to final inspection and acceptance by the Engineer.

Slides and overbreaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as directed by the Engineer at no additional cost to the Owner. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

G. The Contractor shall protect finished lines and grades of completed excavation against excessive erosion, damage from trafficking or other causes.

3.02 Dewatering

The Contractor shall be responsible for all dewatering as required for the completion of the work. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review prior to any earthwork operations. All water removed by dewatering operations shall be disposed of in accordance with the North Carolina Sedimentation Pollution Control Act.

The dewatering system shall be of sufficient size and capacity as required to control groundwater or seepage to permit proper excavation operations, embankment construction and reconstruction, subgrade preparation.

The Contractor shall control, by acceptable means, all water regardless of source. The Contractor shall be fully responsible for disposal of the water and shall provide all necessary means at no additional expense to the Owner. The Contractor shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the system.

3.03 Placement of Compacted Embankment

A. Compacted Embankment is the compacted fill that provides the foundation and the berms for the containment area, as well as the subgrade for some

access roadways. Areas defined as Compacted Embankment are indicated on the Contract Drawings.

B. Surfaces upon which Compacted Embankment is to be constructed shall be stripped of topsoil, organic material, rubbish and other extraneous materials.

C. Prior to placement of Compacted Embankment, the exposed subgrade shall be proofrolled using a loaded pan, dump truck or other suitable equipment in the presence of the Engineer or his representative. Any soft or unsuitable materials revealed before or during the in place compaction shall be removed as directed by the Engineer and replaced with Compacted Embankment.

D. The Compacted Embankment soils shall be as specified under Paragraph 2.01, Compacted Embankment, and shall be deposited and spread in successive, uniform, approximately horizontal layers not exceeding 12-inches loose measure or 8-inches in compacted depth for the full width of the cross section, and shall be kept approximately level by the use of effective spreading equipment. Hauling shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form during the construction of the embankment. The embankment shall be properly drained at all times. Each layer of the embankment shall be thoroughly compacted to the density specified under Paragraph 3.07, Compaction.

E. The Compacted Embankment shall be of the proper moisture content before rolling to obtain the prescribed compaction. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content.

F. Quality Assurance during placement of the Compacted Embankment shall be provided by the Engineer and paid for by the Owner. The frequency of field compaction tests shall be determined by the Engineer. The Contractor shall cooperate with the Engineer or his representative when compaction or other required tests are taken and make adjustments, as required, in the filling and compacting operations to meet the compaction specifications. If the compaction test results do not meet the specified requirements, the Contractor shall add water or dry the material, as may be necessary and continue compaction to achieve the compaction requirements, at his own expense.

3.04 Placement of Fine-Grained Cover Soil

A. Fine Grained Cover Soil shall conform to the requirements outlined in Section 2.02 of these Specifications. It functions as a final cover soil in areas designated on the Contract Drawings.

B. Soil cover shall be placed over Daily or Intermediate Cover soil in areas approved by the Owner. Soil shall be placed parallel to the existing ground surface in lifts not exceeding 12 inches. Additional soil may be placed in localized areas where a "bridge lift" is necessary. Such bridge lifts may exceed 12 inches in thickness as required.

C. Each lift of Fine Grained Cover Soil shall be compacted using a compactor, loaded hauling equipment or equal. Compaction effort shall be distributed over the entire surface of the lift prior to placement of the overlying lift. Compaction shall be as specified in Section 3.07.

D. The total thickness of the Fine Grained Cover Soil shall be at least 24 inches. For landfill sideslopes, this thickness shall be measured perpendicular to the surface of the slope.

E. The surface of the completed Fine Grained Cover Soil shall be graded to maintain positive drainage of the landfill surface and shall be prepared for seeding as outlined in Section 2J of these Specifications.

3.05 Placement of Compacted Soil Barrier

A. All Compacted Soil Barrier at the landfill shall be placed in horizontal lifts no greater than 12 inches, loose measure. The Compacted Soil Barrier shall be free from clods greater than 3 inches in size. Where excessive sized clods do occur, the Contractor shall break up the clods using tracked equipment, disc or other method approved by the Engineer. Each lift shall be compacted prior to placement of succeeding lifts.

B. The Compacted Soil Barrier shall be compacted to the following minimum requirements as required to meet a maximum permeability of 1×10^{-5} cm/sec:

The Compacted Soil Liner shall be compacted to at least 93% of the maximum Standard dry density as determined using ASTM D698. Moisture content shall range from a minimum of 0% above optimum moisture content to a maximum of 6% above optimum

moisture content (ASTM D698). Minimum thickness of this layer is 18 inches.

Any Compacted Soil Liner surface which is smooth, or has a moisture content outside of the specified moisture content range, as defined by ASTM D698, shall be scarified to a depth of 2 to 4 inches and brought to a proper moisture content prior to placement of a subsequent lift.

Lift compaction shall be performed with an appropriately heavy, properly ballasted, penetrating-foot compactor.

C. Quality Assurance Service shall be provided by the Engineer and paid for by the Owner. The frequency of field compaction tests shall be determined by the Engineer. The Contractor shall cooperate with the Engineer or his representative when compaction or other required tests are taken and make adjustments, as required, in the filling and compacting operations to meet the compaction specifications. If compaction test results do not meet the above specified requirements, the Contractor shall add water or dry the material, as may be necessary and continue compaction to achieve these requirements at his own expense, or remove and replace the material to achieve the compaction requirements, at Contractor's expense.

D. Surfaces not properly maintained shall be repaired by the Contractor at no cost to the Owner. A suitable surface for geomembrane construction shall be a surface maintained at the specified compaction and moisture content criteria provided in these Contract Specifications.

E. Locations of control stakes, in-place density tests or other samples in Compacted Soil Liner shall be repaired and recompacted to the requirement outlined above.

3.06 Backfilling for Structures and Piping

A. All structures, including manholes and pipes shall be backfilled with the type of materials shown on the Contract Drawings and specified herein. Select fill shall be deposited in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 1-foot of the final grade or within 2-feet of any plastic pipe or manholes. No stone or fragmentary rock larger than 12-inches in their greatest dimension

will be allowed for any portion of backfill. Compaction shall be in accordance with the requirements of Paragraph 3.07, Compaction.

3.07 Compaction

The Contractor shall compact Compacted Embankment, Fine Grained Cover Soil, Compacted Soil Barrier, backfill, and crushed stone in accordance with the requirements of this Section. The densities specified herein refer to percentages of maximum density as determined by the noted test methods. Compaction of materials on the project shall be in accordance with the following schedule:

	Required % std. Proctor (ASTM D698)	Moisture Content Range (ASTM D698)*	Max. Lift Thickness as Compacted (Inches)
Compacted Embankment	95	N/A	8
Fine Grained Soil Cover	90	N/A	12
Compacted Soil Barrier	93	0 to +6	6
Backfill Around Structures	95	N/A	8
Backfill in Pipe Trenches	95	N/A	6

* Range refers to the percent of in-place moisture content greater than optimum moisture content (+) or lower than optimum moisture content (-).

Field density tests will be made by the Engineer to determine if the specified densities have been achieved, and these tests shall be the basis for accepting or rejecting the compaction. In-place density tests will be performed in accordance with ASTM D 1556, ASTM D 2167, or ASTE D 2922. The Engineer will be the sole judge as to which test method will be the most appropriate. Failure to achieve the specified densities shall require the Contractor to re-compact the material or remove it as required. The Contractor shall, if necessary, increase his compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The Contractor shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

3.08 General Site Grading

Designated disturbed areas shall be uniformly graded to the lines, grades, and elevations shown on the Contract Drawings. Finished surfaces shall be reasonably smooth, compacted, and free from irregular surface changes. Unless otherwise specified, the degree of finish shall be that ordinarily obtainable from either blade or scraper operations. Areas shall be finished to a smoothness suitable for application of topsoil.

* * * *

SECTION 2J
FINAL COVER GRADING, EROSION CONTROL, AND LANDSCAPING

PART 1 - GENERAL

1.01 Work Included

Furnish all labor, equipment, and materials necessary for final cover grading, erosion control, seeding, and miscellaneous site work not included under other Sections, but required to complete the work as shown on the Contract Drawings and specified herein. Under this Section, all areas disturbed by closure activities, excavation, materials storage, temporary roads, etc., shall be protected by erosion control measures and reseeded as specified herein.

It is the intent of this Specification that the Contractor conduct the closure activities in such a manner that erosion of disturbed areas and off site sedimentation be absolutely minimized.

All work under this Contract shall be done in conformance with and subject to the limitations of the North Carolina Rules and Regulations for Erosion and Sedimentation Control as adopted by the North Carolina Sedimentation Control Commission (15 NCAC, Chapter 4).

The following excerpts from the regulations are particularly important:

1) ...slopes left exposed will, within 30 working days of completion of any phase of grading, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion...(Section 6b)

2) ...a ground cover sufficient to restrain erosion must be planted or otherwise provided within 30 working days on that portion of the tract (disturbed area) upon which further active construction is not being undertaken...(Section 6c)

Erosion and sedimentation controls applicable to this project shall include but not be limited to the following items of work:

1. Permanent sediment basins shall be constructed at locations shown on the Contract Drawings and at other locations directed by the Engineer.

2. Temporary diversion ditches shall be constructed adjacent to disturbed areas as shown on the Contract

Drawings to collect surface runoff from disturbed areas and direct the runoff to the temporary sediment basins. All such temporary diversion ditches shall terminate with temporary sediment basins or filter berm basins as shown on the Contract Drawings.

3. Erect silt fence at locations shown on the Contract Drawings and at other locations directed by the Engineer.

4. Provide temporary or permanent ground cover adequate to restrain erosion on erodible slopes or other areas that will be left unworked for periods exceeding 30 calendar days.

5. The Contractor shall be responsible for developing suitable erosion control measures for all off site waste and borrow areas to the satisfaction of the Engineer. The Contractor is also advised that off site borrow areas more than one acre in size shall comply with all provisions of N.C. Mining Act.

6. Construct 50 foot gravel buffers at entrances from public roads to all unpaved access roads used by the Contractor. The Contractor shall maintain the gravel buffers for the Contract duration or until final pavement, where applicable, has been constructed.

7. Provide other types of erosion and sedimentation control devices at the locations shown on the Contract Drawings, or as specified herein.

1.02 Contractor's Responsibilities

Furnish and submit certification for the materials used as specified in the General Conditions, Division 1 and Division 2.

PART 2 - MATERIALS

2.01 Permanent Sediment Basins

Permanent sediment basins shall be constructed at locations shown on Contract Drawings and specified herein. Basins shall be constructed before or as soon as practical after any clearing activities begin and before any construction activities may begin. The permanent basins shall be maintained to the satisfaction of the Engineer until the site has been stabilized. Proper maintenance shall include, but not be limited to, the periodic removal and proper disposal of trapped sediments

and clearing of obstructions from the principal and emergency spillways.

2.02 Silt Fence

Silt fences shall be erected as shown on the Contract Drawings and specified herein. The silt fences shall be erected and maintained to the satisfaction of the Engineer until a vegetative ground cover has been established. Proper maintenance shall include, but not be limited to, the periodic removal of trapped sediments and replacement of the filter fabric should it deteriorate to a point that in the opinion of the Engineer it will no longer provide an adequate runoff filter. Replacement of the filter fabric, if required by the Engineer, will be at the Contractor's expense.

Posts: Posts for silt fence shall be steel and shall have the following properties:

ASTM Designation: ASTM 702
Length: 5-Feet Long (T-Type)
Weight: 1.25#/Foot (min.)
Area of Anchor Plate: 14 Sq. In.

Note: Five (T) Fasteners shall be furnished with each post.

The filter geotextile shall conform to the requirements set forth in Section 2.03.

Geotextile Geotextile for the silt fence shall have the following minimum properties:

Geotextile shall be a woven geotextile made specifically for sediment control. Geotextile shall not rot when buried and shall resist attack from soil chemicals, alkalies and acids in the PH range from 2 to 13, and shall resist damage due to prolonged ultraviolet exposure.

	Minimum Value	Test Method
Mass Per Unit Area	2.8 oz/yd^2	ASTM D5261
Grab Tensile Strength	120 lbs	ASTM D4632
Grab Elongation	20%	ASTM D4632
Trapezoid Tear Strength	50 lbs	ASTM D4533
Mullen Burst Strength	280 lbs	ASTM D3786
Puncture Strength	60 lbs	ASTM D4833
Retained Strength (500 hrs. accelerated UV exposure)	90%	ASTM D4355
Height	36 inches	—

After the completion of the project, the Contractor shall remove all silt fence in areas where a good stand of grass has been established and erosion is no longer evident. Removal of the remainder of the silt fence shall occur as other areas are established. Removal of silt fence shall be permitted only with the prior approval of the Engineer.

The Engineer may direct the Contractor to erect and maintain silt fence at other locations not shown on the Contract Drawings. Payment for this work shall be at the unit price bid for this item.

2.03 Filter Geotextile

The Filter Geotextile shall conform to the following requirements:

Geotextile Property*	Filter Geotextile	Test Method
Geotextile Construction	Nonwoven Needlepunched	
Mass per Unit Area (Unit Weight) (oz/yd^2)	5.5	ASTM D3776
Ultraviolet Resistance, (500 hrs.) Average % Strength Retention	70	ASTM D4355
Grab Tensile Strength (lbs.)	130	ASTM D4632
Grab Tensile elongation (%)	25	ASTM D4632
Wide Width Tensile Strength, (lbs./in.)	N/A	ASTM D4595
Wide Width elongation (%) at Break	N/A	ASTM D4495
Burst Strength, Diaphragm Method (psi)	200	ASTM D3786
Apparent Opening Size (AOS), (mm)	0.2 - 0.35	ASTM D4751
Permittivity at 50 mm constant head (sec^{-1})	1	ASTM D4491
Puncture Resistance, (lb)	40	ASTM D4833

* Minimum Values

During all periods of shipment and storage, the Filter Geotextile shall be wrapped in heavy-duty protective covering which will protect it from sunlight, mud, dust, dirt, and debris. The Filter Geotextile shall not be exposed to temperatures greater than 140°F. After the protective covering has been removed, the Filter

Geotextile shall not be left uncovered under any circumstances for longer than three (3) days.

Each roll of Filter Geotextile will be visually inspected by the Engineer or his representative. The Engineer reserves the right to sample and test at any time and reject, if necessary, any material based on visual inspection or verification tests.

Filter Geotextile shall be installed in such a manner that all splice joints are provided with a minimum overlap of 12-inches. Field splices shall be anchored with anchor pins to insure that required overlap is maintained. At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deteriorations, or damage incurred during manufacture, transportation, or storage.

Backfilling operations shall be done so as to prevent damage to the Filter Geotextile. Damaged sections of Filter Geotextile shall be replaced at no cost to the Owner.

Installation of geotextile shall be done in a manner so as not to rupture, tear, puncture, cut, or abrade the materials. Where such damage occurs, it shall be repaired with a patch which extends at least 18 inches beyond the edge of the damaged area.

2.04 Temporary Sediment Basins

Temporary sediment basins shall be constructed as shown on the Contract Drawings and as specified herein. The temporary sediment basins shall be constructed and maintained to the satisfaction of the Engineer until a vegetative ground cover has been established. Proper maintenance will include, but not be limited to, the periodic removal of trapped sediments. The cost of the temporary sediment basins shall include the excavation, grading, diversion ditches, stone for erosion control, washed stone, geotextile, etc. and all maintenance activities required.

The Engineer may direct the Contractor to erect and maintain temporary sediment basins at other locations not shown on the Contract Drawings. Payment for this work shall be at the unit price bid for this item.

2.05 Gravel and Rip-Rap Filter Berm Basins

Gravel and rip-rap filter berm basins shall be constructed as shown on the Contract Drawings and as specified herein. The filter berm basins shall be

constructed at the upstream end of all culverts as indicated and maintained to the satisfaction of the Engineer until the site has been stabilized. Proper maintenance will include, but not be limited to, the periodic removal and proper disposal of trapped sediments. The cost of the filter berms shall include the excavation, grading, stone for erosion control, rip-rap, etc. and all maintenance activities required.

The Contractor shall inspect the filter berm basins after each significant rainfall, and at regularly scheduled intervals, and repair or replace the filter berm basin if the Engineer determines unsatisfactory amounts of sediments are entering the culverts until the site has been stabilized.

The Engineer may direct the Contractor to erect and maintain gravel and rip-rap filter berm basins at other locations not shown on the Contract Drawings. Payment for this work shall be at the unit bid price for this item.

2.06 Stone Check Dams

Stone check dams shall be constructed as shown on the Contract Drawings and as specified herein. The stone check dams shall be constructed and maintained to the satisfaction of the Engineer until a vegetative ground cover has been established. Proper maintenance will include, but not be limited to, the periodic removal of trapped sediments. The cost of the stone check dams shall include the excavation, grading, stone for erosion control or rip rap, washed stone, etc., and all maintenance activities required.

The Engineer may direct the Contractor to erect and maintain stone check dams at other locations not shown on the Contract Drawings. Payment for this work shall be at the unit price bid for this item.

2.07 Stone Filters

Stone filters shall be constructed as shown on the Contract Drawings and as specified herein. The stone filters shall be constructed and maintained to the satisfaction of the Engineer until a vegetative ground cover has been established. Proper maintenance will include, but not be limited to, the periodic removal of trapped sediments. The cost of the stone filters shall include the excavation, grading, washed stone, filter fabric, steel post, etc., and all maintenance activities required.

The Engineer may direct the Contractor to erect and maintain stone filters at other locations not shown on the Contract Drawings. Payment for this work shall be at the unit price bid for this item.

2.08 Rip Rap

The Contractor shall place rip rap as shown on the Contract Drawings. The stone for rip rap shall consist of field stone or rough unhewn quarry stone. The stone shall be sound, tough, dense, and resistant to the action of air and water. The rip rap shall be Class I as specified in the NCDOT Standard Specifications. The stone shall vary in weight from 5 to 200 pounds. At least 30 percent of the total weight of the rip rap shall be in individual pieces weighing a minimum of 60 pounds each. Not more than 10 percent of the total weight of the rip rap shall be in individual pieces weighing less than 15 pounds each.

During placing, the stone shall be graded so that the smaller stones are uniformly distributed throughout the mass. The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary or ordered by the Engineer. The placed rip rap shall form a properly graded, dense, neat layer of stone. The placed rip rap shall have a minimum depth of 24-inches and shall have a layer of geotextile as specified in Section 2.03 placed between the soil and the stone.

The Engineer may direct the Contractor to place rip rap at other locations not shown on the Contract Drawings. Payment for this work shall be at the unit price bid for this item.

2.09 Stone for Erosion Control

The Contractor shall place Stone for Erosion Control as shown on the Contract Drawings, as specified herein and as specified in Section 1042-2 of the NCDOT Standard Specifications. The Stone for Erosion Control shall be Class (A) or Class (B), as shown on the Contract Drawings.

Stone for Erosion Control shall be dumped and placed in such a manner that the larger rock fragments are uniformly distributed throughout the rock mass and the smaller fragments fill the voids between the larger fragments. Rearranging of individual stones by equipment or by hand shall only be required to the extent necessary to secure the results specified above and to protect structures from damage when rock material is placed against the structures. The placed stone shall be the

minimum thickness shown on the Contract Drawings and shall have a layer of geotextile as specified in Section 2.03 placed between the soil and the stone.

The Engineer may direct the Contractor to place Stone for Erosion Control at other locations not shown on the Contract Drawings. Payment for this work shall be at the unit price bid for this item.

2.10 Straw with Net Temporary Ditch Lining

The Contractor shall place straw with net temporary ditch lining in ditches as shown on the Contract Drawings. The blanket shall consist of clean wheat straw from agricultural crops made into a knitted straw blanket that is machine assembled. The straw shall be evenly distributed throughout the blanket. The blanket shall be covered with a photodegradable synthetic mesh attached to the straw with degradable thread.

The Contractor shall place the straw with net temporary liner where directed immediately after the ditch has been properly graded and prepared, fertilized, and seeded. The netting shall be on top with the straw in contact with the soil. The blanket shall be unrolled in the ditch in the direction of the flow of water. The end of the upstream blanket shall overlap the buried end of the downstream blanket by a minimum of 4 inches. The blanket shall be stapled as per manufacturer's specifications.

Straw with net shall be North American Green S150, ECS High Velocity Straw Mat, or approved equal.

The Contractor will immediately repair or replace any section of straw with net ditch lining which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

The Engineer may direct the Contractor to place straw with net ditch liner at other locations not shown on Contract Drawings. Payment for this work shall be at the unit bid price for this item.

2.11 Curled Wood Mat Temporary Ditch Lining

The Contractor shall place curled wood mat temporary ditch lining in ditches as shown on the Contract Drawings. The mat shall consist of machine-produced mat of curled wood excelsior with a majority of the fibers 6 inches or longer with consistent thickness and the fibers evenly distributed over the entire area of the blanket. The top of the mat shall be covered with a biodegradable

synthetic mesh. The mesh shall be attached to the curled wood excelsior with photodegradable synthetic yarn.

The Contractor shall place the curled wood mat temporary liner where directed immediately after the ditch has been properly graded and prepared, fertilized, and seeded. The mesh shall be on top with the wood fibers in contact with the soil. The mat shall be unrolled in the ditch in the direction of the flow of water. The end of the upstream blanket shall overlap the buried end of the downstream blanket by a minimum of 4 inches. The mat shall be stapled as per manufacturer's specifications.

Curled wood mat shall be Excelsior High Impact, North American Green C125, or approved equal.

The Contractor will immediately repair or replace any section of mat which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

The Engineer may direct the Contractor to place curled wood mat ditch liner at other locations not shown on Contract Drawings. Payment for this work shall be at the unit bid price for this item.

2.12 Synthetic Mat Permanent Ditch Lining

The Contractor shall place synthetic mat permanent ditch lining in ditches as shown on the Contract Drawings. The mat shall consist of entangled nylon, polypropylene or polyester monofilaments mechanically joined at their intersections forming a three dimensional structure. The mat shall be crush-resistant, pliable, water-permeable, and highly resistent to chemical and environmental degradation.

The Contractor shall place the synthetic mat where directed immediately after the ditch has been properly graded and prepared. The mat shall be unrolled in the direction of the flow of water. The upstream end of each section shall be secured in an anchor trench at least twelve inches deep. The upstream end of mat shall overlap the downstream section by a minimum of three feet, with the upstream length on top. The mat shall be staked as per manufacturer's specifications.

After the mat has been placed, the area shall be properly fertilized and seeded as specified allowing the fertilizer and seeds to drop through the net.

Synthetic mat shall be Enkamat 7020, Synthetic Industries Landlock Erosion Mat TRM T060, or approved equal.

The Contractor will immediately repair or replace any section of mat which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

The Engineer may direct the Contractor to place synthetic mat ditch liner at other locations not shown on Contract Drawings. Payment for this work shall be paid at the unit bid price for this item.

2.13 Water

Water will be furnished to the Contractor by the Owner from existing facilities as directed by the Engineer. The Contractor shall furnish all hoses and connections necessary to complete the landscaping work.

2.14 Fertilizer

Fertilizer shall be a complete commercial fertilizer with components derived from commercial sources. Fertilizer analysis shall be determined from field soil sampling in appropriate number taken by the Contractor and analyzed by the N.C. Department of Agriculture or other independent laboratory. Contractor shall furnish fertilizer in accordance with the recommendations of the Department of Agriculture.

One-quarter of the Nitrogen shall be in the form of nitrates, one-quarter in the form of ammonia salts, and one-half in the form of natural organic Nitrogen. Available Phosphoric Acid shall be free from superphosphate, bone, or tankage. Potash shall be Sulphate of Potash. Elements shall conform to the standards of Association of Official Agricultural Chemists.

Fertilizer shall be delivered in standard size bags marked with the weight, analysis of contents, and the name of the manufacturer. Fertilizer shall be stored in weatherproof storage areas and in such a manner that its effectiveness will not be impaired.

2.15 Lime

At least 50% shall pass a No. 200 U.S.S. mesh sieve. At least 90% shall pass a No. 100 U.S.S. mesh sieve and 100% shall pass a No. 10 U.S.S. mesh sieve. Total carbonates shall not be less than 80% or 44.8% Calcium Oxide equivalent. For the purpose of calculation, total carbonates shall be considered as Calcium Carbonate.

2.16 Grass Seed

The Contractor shall furnish the kinds and amounts of seed to be seeded in all areas disturbed by the construction work. All seed shall be labeled to show that it meets the requirements of the North Carolina Seed Law. All seed must have been tested within six (6) months immediately preceding the planting of such material on the job.

The inoculant for treating legume seed shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species. Inoculants shall not be used later than the date indicated on the container. The quality of the seed shall conform to the following:

Type	Minimum Seed Purity (%)	Minimum Germination (%)	Maximum Weed Seed (%)
Fescue (fungus free)	98	90	1.00
Hybrid Rye	98	85	0.10
Sudan grass	98	85	0.25
Millet	98	85	0.50
Sericea Lespedeza			
Scarified	98	85	0.50
Unscarified	98	85	0.50

Scarified Lespedeza may contain 20% hard seed and unscarified 50% hard seed. Seed containing prohibited noxious weed seed shall not be accepted. Seed shall be in conformance with N.C. Seed Law restrictions for restricted noxious weeds.

2.17 Wood Cellulose Fiber Mulch

Wood cellulose fiber mulch for use in hydroseeding grass seed in combination with fertilizers and other approved additions, shall consist of especially prepared wood cellulose fibers such as "Conwed", "Silva-Fiber", or equal, and have no growth or germination inhibiting factors.

The wood cellulose fiber shall have the additional characteristic of dispersing rapidly in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit, or adequate equal, with the specified materials.

When applied, the wood cellulose fiber with additives will form an absorptive mat but not a plant inhibiting membrane, which will allow moisture, natural or mechanical, to percolate into underlying soil.

The mulch shall be supplied, compressed in packages containing 50 pounds of material having an equilibrium air dry moisture content at time of manufacture of 12% plus or minus 2%. Wood cellulose fiber mulch shall be stored in a weatherproof storage area and in such a manner that effectiveness will not be impaired.

2.18 Straw Mulch

Straw used for mulch shall be small grain hay. Hay shall be undamaged, air dry, threshed straw, free of undesirable weed seed. Straw mulch is not required for seeded areas treated with a temporary soil stabilizer.

2.19 Temporary Soil Stabilizer

The temporary agent for soil erosion control shall consist of an especially prepared highly concentrated powder which, when mixed with water, forms a thick liquid such as "TerraTack III", "Curasol AE", "Aerospray 70", or equal, and having no growth or germination inhibiting factors. The agent shall be used for hydroseeding grass seed in combination with other approved amendments resulting in a highly viscous slurry which, when sprayed directly on the soil, forms a gelatinous crust.

2.20 Other Work

In addition to the silt fences, temporary sediment basins, stone filters, etc., shown on the Contract Drawings, the Contractor shall provide adequate means to prevent any sediment from entering any storm drains (curb inlet filter box), ditches, streams, or bodies of water downstream of any area disturbed by construction. Excavation materials shall be placed upstream of any trench or other excavation to prevent sedimentation of offsite areas. In areas where a natural buffer area exists between the work area and the closest stream or water course, this area shall not be disturbed. All streets and driveways shall be scraped and swept as necessary to prevent the accumulation of dirt and debris. Work associated with this provision shall be considered incidental to the project and no specific payment will be made.

2.21 Temporary Ground Cover

Provide temporary or permanent ground cover adequate to restrain erosion on erodible slopes or other areas that will be left unworked for periods exceeding 30 calendar days.

PART 3 - EXECUTION

3.01 Establishment of Erosion Control Devices

Due to the nature of the work required by this Contract, it is anticipated that the location and nature of the erosion control devices will be adjusted on several occasions to reflect the current phase of construction. Erosion control device(s) as required shall be established immediately upon beginning of the closure operation.

The construction schedule adopted by the Contractor will impact the placement and need for specific devices required for the control of erosion. The Contractor shall develop and implement such additional techniques as may be required to minimize erosion and off site sedimentation. The location and extent of erosion control devices shall be revised at each phase of construction that results in a change in either the quantity or direction of surface runoff from construction areas. All deviations from the control provisions shown on the Contract Drawings shall have the prior approval of the Engineer.

3.02 Maintenance of Erosion Control Devices

The Contractor shall furnish the labor, materials and equipment required for routine maintenance of all erosion control devices. Maintenance shall be scheduled as required for a particular device to maintain the removal efficiency and intent of the device. All erosion control devices shall be inspected immediately after each significant rainfall event, and appropriate maintenance conducted. Maintenance shall include but not be limited to 1) the removal and satisfactory disposal of trapped sediments from basins or silt barriers and 2) replacement of filter fabrics used for silt fences upon loss of specified efficiency. Sediments removed from erosion control devices shall be disposed of in locations that will not result in off site sedimentation as approved by the Engineer.

3.03 Grading

After approval of the rough grading, the Contractor shall commence his preparations of the subgrade for the various major conditions of the work as follows:

Bare soil for rip rap area at subgrade (24-inches below final grade, or as directed by the Engineer).

Final surface grading of the landscape graveled and rip rapped areas shall be mechanically raked or hand raked to an even finished surface alignment.

3.04 Hydroseeding and Grass

The Contractor shall grow a stand of grass by hydroseeding method on all disturbed areas. The Contractor shall be responsible for the satisfactory growth of grass throughout the period of the one-year guarantee.

The Contractor's work shall include the preparation of the bare soil seed bed, application of fertilizer, limestone, mulching, inoculant, temporary soil stabilizer, watering, and all other operations necessary to provide a satisfactory growth of sod at the end of the one-year maintenance period. Areas without satisfactory sod at the end of one (1) year shall be replanted until satisfactory growth is obtained and acceptable to the Engineer.

All areas to be seeded shall be done by the hydraulic seeding method including all additives and amendments required. A "Reinco", "Finn", or "Bowie" type hydromulcher with adjustable nozzles and extension hoses, or equal, shall be utilized. General capacity of tank should range from 500 to 2,500 gallons, or as approved by the Engineer.

Hydraulic seeding shall be carried out in three steps. Step one shall consist of the application of lime. In step two the seed mixture shall be mixed with the fertilizer, wood cellulose fiber mulch, and any required inoculants and applied to the seed bed. Step three shall consist of application of top dressing during the first spring or fall, whichever comes first, after step two.

Top dressing shall consist of a commercial grade fertilizer plus Nitrogen or other analysis as may be recommended by soil testing. Types and application rates of seed mixtures, lime, fertilizer, and wood cellulose fiber mulch, shall be as shown in the Seeding Schedule.

Ingredients for the mixture and steps should be dumped into a tank of water and thoroughly mixed to a homogeneous slurry and sprayed out under a minimum of 300-350 pounds pressure, in suitable proportions to accommodate the type and capacity of the hydraulic machine to be used. Applications shall be evenly sprayed over the ground surface. The Contractor shall free the soil of stones, roots, rubbish, and other deleterious materials and dispose of same off the site. The bare soil, except existing steep embankment area, shall be rough raked to remove stones, roots, and rubbish over 4-inches in size, and other deleterious materials and dispose of same off the site.

No seeding should be undertaken in windy or unfavorable weather, when the ground is too wet to rake easily, when it is in a frozen condition, or too dry. Any bare spots shown in two to three weeks shall be recultivated, fertilized at half the rate, raked, seeded, and mulched again by mechanical or hand broadcast method acceptable to the Engineer.

Areas that have been seeded with a temporary seed mixture shall be mowed to a height of less than 2-inches and scarified prior to seeding with the permanent seed mixture.

The Contractor shall provide, at his own expense, protection for all seeded areas against trespassing and damage at all times until acceptance of the work. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly at the Contractor's expense.

The Contractor shall water newly seeded areas of the lawn and road shoulder mix once a week until the grasses have germinated sufficiently to produce a healthy turf, or unless otherwise directed by the Engineer. Each watering shall provide three (3) gallons per square yard. The Contractor shall furnish all necessary hoses, sprinklers, and connections.

The first and second cutting of the lawn grasses only shall be done by the Contractor. All subsequent cuttings will be done by the Owner's forces in a manner specified by the Contractor.

3.05 Maintenance

The Contractor shall be responsible for maintaining all seeded areas through the end of his warranty period. Maintenance shall include but not be limited to, annual fertilization, mowing, repair of seeded areas, irrigation, and weed control. The Contractor shall

provide, at his own expense, protection for all seeded areas against trespassing and damage at all times until acceptance of the work. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly at the Contractor's expense.

Annual fertilization shall consist of an application of 500#/acre of 10-10-10 commercial grade fertilizer, or its equivalent and 60#/acre of nitrogen in early fall, or other analysis as may be determined by soil test. Annual fertilization shall be in addition to top dressing and shall be performed by the Contractor each fall season after planting until the work is substantially complete.

Mowing shall be scheduled so as to maintain a minimum stand height of 4-inches or as directed by the Engineer. Stand height shall be allowed to reach 8 to 10-inches prior to mowing.

All seeded areas shall be inspected on a regular basis and any necessary repairs or reseedings made within the planting season, if possible. If the stand should be over 60% damaged, it shall be re-established following the original seeding recommendations.

Weed growth shall be maintained mechanically. No herbicide shall be used.

3.06 Cleanup

The Contractor shall remove from the site all subsoil excavated from his work and all other debris including, but not limited to, branches, paper, and rubbish in all landscape areas, and remove temporary barricades as the work proceeds.

All areas shall be kept in a neat, orderly condition at all times. Prior to final acceptance, the Contractor shall clean up the entire landscaped area to the satisfaction of the Engineer.

3.07 Seeding Schedule

All seeding and mulching to be completed by the Contractor shall conform to the schedule as shown on the Contract Drawings. No permanent seeding shall be performed from June 1 - August 31 and December 1 - January 31. Temporary seed mixtures will be used during these times if seeding is necessary. Areas seeded with temporary seed mixtures shall be reseeded by the Contractor at no additional cost to the Owner with permanent seed as directed by the Engineer.

Application rates of seed mixtures, lime, fertilizer, mulch and top dressing are shown in the schedule on the Contract Drawings.

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APPENDIX II - CLOSURE PLAN DRAWINGS

(Submitted Separately)

DRAWING NUMBER	TITLE	SHEET NUMBER
X1	Index of Drawings, Symbols and Abbreviations	1
G1	Existing Site Conditions	2
G2	Existing Site Conditions	3
G3	Final Cover Grading Plan	4
G4	General Details and Sections	5
EC1	Erosion and Sedimentation Control Plan	6
EC2	Erosion and Sedimentation Control Sections and Details	7